

Aquaculture in Alberta

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AQUAPONICS

Aquaponics is the combined culture of fish and plants in recirculating aquaculture systems. Water, used in raising fish, provides a source of nutrients for greenhouse plants. Plants directly remove nutrients from the waste water and return this nutrient reduced water to the aquaculture facility for reuse.

Aquaponics is becoming more common in northern climates under greenhouse conditions and could eventually provide a significant source of edible or decorative plant production.

Three aquaponic programs in Alberta include: Lethbridge Community College, Greenview AquaFarm, near Calgary and Circle M Trout Farm, near St. Paul.

At Greenview AquaFarm, the aquaponic greenhouses are managed by Victoria



Raising basil and lettuce at the Lethbridge Community College aquaponic greenhouses

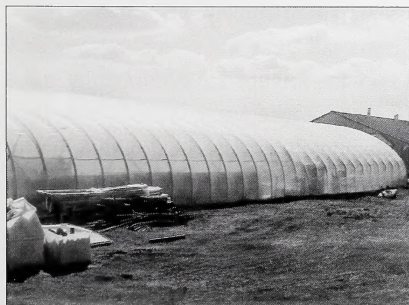
Page. They have been in operation for a couple of years, that is, until the top of the greenhouse tore away on a freezing night last November. Page noted that by then they had proven success in growing such crops as watercress, tomatoes, Chinese eggplant, water spinach, cucumbers, various lettuces, chives, basil, corn and succulent cantaloupe!

"Some of our growth results far exceeded any in the field," comments Page, "even though no fertilizer was added. Combining the greenhouse with our aquaculture facility resulted in saving fertilizer and some heating costs. Our warm tilapia water provided partial heat to the greenhouse. Another saving we realized is being located in the Prairies, as the bountiful sunny winter days provided supplemental lighting and heat. To us, aquaponics will provide a clear market advantage by being able to produce crops year round, or nearly so."

An "Aquaponic Pilot Project" is presently being conducted at the Lethbridge Community College (LCC) Aquaculture Centre, with support from LCC and Alberta Agriculture, Food & Rural Development. The study is housed within a 1000 m² greenhouse equipped with hydroponic troughs, lighting and lined fish culture ponds. Nutrient rich waste water is pumped from a pond stocked with silver carp to hydroponic troughs containing pots growing Romaine lettuce and basil.

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Aquaponic greenhouse at Greenview AquaFarm Ltd., east of Calgary, using warm water from their adjoining tilapia facility

According to Ron Beck, AAFRD's senior aquaculture biologist, "the LCC's aquaponic studies focus on four projects. These include: 1) waste nutrient transfer from fish to plants, 2) identifying specific nutrient requirements and limitations in aquaponic systems, 3) evaluating the biofiltration potential of aquaponic systems, and 4) assessing the maximum fish rearing potential within integrated systems." Beck hopes to determine operational costs, profitability, and market potential for fish and plants cultured in aquaponic systems.

The facility serves as a demonstration and training centre for students and commercial fish producers who would like to diversify into alternate crops, supported through an existing fish culture operation.

Beck notes that a typical recirculating system exchanges 5 - 10% of its water volume daily. This helps to avoid accumulation of wastes, such as nitrate. "Within an aquaponic system we should be able to reduce water exchange down to 1.5% or less."

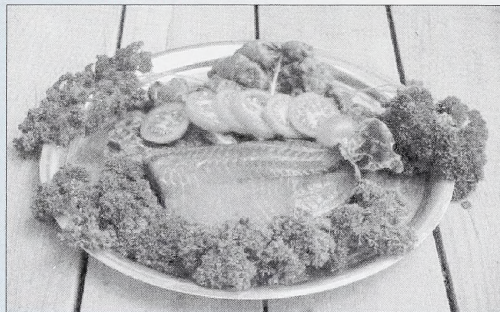
The third aquaponic facility in Alberta is located at Circle M Trout Farm. Owner, Doug Millar notes that he is still experimenting with plants. According to Millar, he must raise plant varieties that are more cold tolerant, as his facility is geared toward cold-water trout species.

A great deal of interest in aquaponics is being shown among people who are environmentally oriented. They appreciate the self-sustaining concept of raising fish, while incorporating plants to recycle nutrients and purify the water.

Other niche markets that have been identified for specific hydroponically culture plants include: numerous Chinese herbs, orchids and aquatic ornamentals. Aquaponics provide an environmentally friendly approach to fish nutrient waste management and additional income, while saving on the water and fertilizer bill 🐟

The Art of Smoking Fish!

Dan Menard is in the business of raising rainbow trout and then adding value by selling his product smoked. He sells directly to farmers markets in the Red Deer



Smoking fish will help preserve the flesh, while imparting a delightful flavour.

area. Menard says "Smoking fish is quite simple, anyone can accomplish satisfactory results. However, producing a consistently superior product for the consumer requires top ingredients, perfect brines, smoking experience, and knowledge of food quality management and packaging."

Dan notes four basic steps in smoking. "First, use only fresh, cleaned fish. Second, brine the fish in ingredients that preserves and flavors the flesh, knowing how long to brine the fish and salinity of the brine. Third, dry the fish after brining, to form an important "pellicle" or almost dry coating. Fourth, is smoking. What kind of wood you use to smoke depends on your taste preference or your customers. It could be hickory, apple, cherry, alder, mesquite, or combinations. Will you use a hot smoke that cooks the meat or will you use a cold smoke? Many books are available on smoking fish, as well, unlimited information can be found on the Internet."

What kind of smoker are you looking for? Many sporting goods and department stores sell small electric smokers. These units cost around \$100 and will smoke your weekend catch in 12 to 20 hours. When using these smokers, it is important to move fish around, as consistent temperature control is limited. Commercial smokers are available, with moderate-sized ones selling around \$30,000. Occasionally, used smokers become available for sale.

Smokers can also be made from fridges, bricks, wood or metal, sized to your desire for fish, sausages or jerky. Just remember when constructing your own to consider concerns with electrical consumption and combustible materials. Why not try the local Butchers and Packers Supply, a supply store with outlets in Calgary, Edmonton and Grande Prairie. They sell smoking wood (some in bulk), brine cures, spices, books, recipes, knives, packaging, and sausage making equipment.

What about product safety? In commercial smoking you need to continuously know brine strength, drying time and temperatures to reduce bacterial contamination. Hot smoked fish need to reach an internal temperature of at least 63°C (145°F). Cold smoked fish need to reach internal temperatures no greater than 32°C (90°F). Dan recommends refrigerating what you can eat within a week. Otherwise, freeze the rest 🐟

Dan Menard, owner of Smoky Trout Farm
RR1 Site 3 Box 26, Red Deer, AB (403) 342-5206

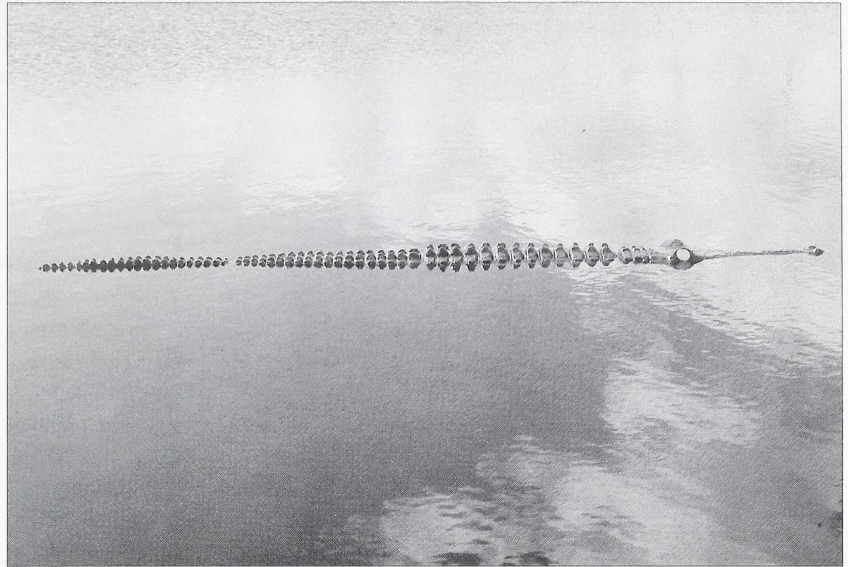
Scare Away Cormorants ... Using an Alligator Decoy

Martin Hofer of the Clearview Colony, north of Bassano, was having trouble with cormorants on the colony reservoir. They completely cleaned out his stocked grass carp and the rainbow trout were scarce. There was also trouble with seagulls and pelicans. Stringing lines across the dugout was tried, with limited success.

One answer appeared to Mr. Hofer, in an article of the Western Producer (October 14, 1999). It mentions using an alligator decoy to scare away birds. From the article, Martin Hofer was able to purchase a 4-metre long plastic alligator, that was shipped out in four pieces, for later joining. The decoy's eyes consisted of two large luminous reflectors, to capture the realistic qualities of the gator imitation.

The company "Gaturz Concepts Ltd." out of Goodlands, Manitoba makes the alligator decoy. The idea was conceived because, Brendan Morningstar, was having such cormorant trouble in his fish pond, that he carved out a wooden alligator to try. The alligator worked well, but later got waterlogged and sunk. Now he's gone into manufacturing gators out of molded ABS plastic. Morningstar notes "It's been three years running that a fake alligator has been protecting his pond and cormorant predation has ceased."

So far, eight decoy alligators have been sold to Alberta clients, including four to a company near Athabasca. These were destined for a lake where cormorants



Plastic four-metre alligator maintains a constant vigil at the Clearview Colony Dugout.

had moved in to feed on 40,000 stocked rainbow trout. Even the United States Dept. of Agriculture have ordered a few, testing their potential on cormorants in Arkansas.


The alligator works, under the presumption that cormorants migrate and overwinter in areas frequented by alligators, a major predator. So far, in three weeks, Martin Hofer has not seen a cormorant. There have been suggestions that they also work well on great blue herons, pelicans and geese.

According to Eric Hutchings, aquaculture biologist for AAFRD, "the question will be; how long the alligator decoy works? Wildlife, particularly hungry animals, tend to test their adversary when the stimulus for food becomes great enough. That is why human-like scarecrows must be regularly moved."

Hutchings notes the decoy alligator might prove a successful deterrent in ponds where cormorants, pelicans or great blue herons are occasional visitors. This is because the birds will move on. However, where fish ponds are located near heavy densities of predator birds, the probability is high that such a decoy will be routinely tested.

Hutchings questions whether most of the cormorants have seen live alligators, but adds the decoy might merely trigger the bird's innate or instinctive behavior to flee.

Time will tell!

Right now, Martin Hofer feels the \$140 cost is well worth not having the inconvenience of stringing up unsightly lines. Now he has only one anchor rope to take care of 

U-FISH OPPORTUNITIES

In Alberta there are about 15 licenced U-fish corporations, which allow fishing opportunities on their property for a fee. Following is a comparison of two operators from the south and central parts of Alberta. Anglers at these private U-fish ponds do not require a Provincial fishing licence to fish.

THE GARDEN

Owned and operated by Allen Schernus at
Glenmore Trail & 180 St. Calgary



The Garden is a spot where you can pick tantalizing strawberries, other fruit, vegetables, flowers and even catch a rainbow trout. Located just east of Calgary in the M.D. of Rocky View, the pond is about half a hectare in size, with a maximum depth of 4 metres.

"There are trout in the pond," Schernus estimates, "that will measure anywhere from 30 to more than 50 cm long." Each spring Schernus purchases rainbow trout from Alberta fingerling suppliers at a size ready to catch - 30 cm (12"). "This year we will be stocking about 800 rainbow trout" says Al Schernus. "All fish caught by anglers must be kept, due to the potential for mortality."

"We charge you \$1.00 to fish; then you pay per length of fish caught. On average, the size of rainbow trout caught is between 30 to 40 cm (12-16") and will cost you \$7.50. Fishing equipment is available for rent at a modest price. This fishing equipment, called the Huckleberry Fin style, consists of a 3-metre bamboo pole, a bobber and a single baited hook. Quite effective, with no messed up reels to contend with.

We haven't advertised much for U-fish, mainly because our business specializes in strawberries and gardens. However, on a typically busy Sunday, we could have up to 25 individuals angling at one time, around the pond. U-fish to us is not a major moneymaker, but does provide "The Garden" with a pleasant supplemental income and some diversity. "My enjoyment" notes Al Schernus, "is getting to watch a child's excitement and reactions, when they catch their first fish ever!"

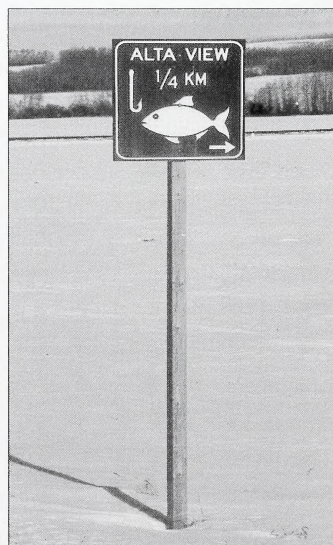
ALTA VIEW TROUT

Owned and operated by Doug Smith, north
of Innisfail on Antler Hill

For nearly 20 years, Alta View Trout has been providing U-fish opportunities to people in central Alberta. "Some visitors travel for over two hours, just to fish here" notes Doug Smith. "There are even customers fishing here who have fish in their own backyard ponds."

"Our six trout ponds are open every day of the week, except Mondays," says Smith. "I have two rules. One is: whatever fish you catch, you keep. The second is you must have a minimum 2.7 kg (6 lb.) test line, to handle big fish." Alta View Trout stocks mainly rainbow trout, but one pond is stocked with "brook trout only." To date, the largest trout caught weighed 3 kg (7 lb.). Doug Smith knows in one of his "rainbow only" ponds there are trout larger than 4 kg (9 lb.).

Smith sells his fishing opportunity by charging per length of fish caught. Although there is an initial cover charge of \$5.00, this cost is credited toward the fish that are caught. In 1999, Smith had more than 1700 anglers show up at his ponds. Fishermen are allowed to clean their catch on-site. "We supply them with ice and bags" says Smith, "to ensure the high eating quality of their catch."



Every year Doug Smith restocks his ponds with fish he raises from eggs. The small fingerlings are grown indoors for at least a year. As a general rule Smith only feeds his outdoor fish once a week. This helps keep the ponds clean and the fish hungry. Smith believes maintaining consistent year-round aeration, has been the key to many years of successfully raising fish in his outdoor ponds. 🐟

MYTHS ABOUT AERATION ... THE BIG PICTURE

by Dr. Bill Mackay, University of Alberta, Department of Biological Sciences, from Prairie Farm Rehabilitation Administration (PFRA) Water Quality Matters publications*.

The best water for raising fish is sweet, clear and well aerated. This kind of water is found in mountain streams, but not very often in fish ponds. Fish require oxygen to live. Minimum level for survival of rainbow trout is about 2.5 ppm (mg/L) in summer and slightly less during the winter. Decisions concerning pond management should be based on best available information, with a view to maintain maximum sustainable water quality, keeping your fish alive and healthy!

MYTH: *Aerating in summer heats up the water.*

THE FACTS: No, it is the radiant energy of the sun that heats water in the summer. Shading of the dugout has more effect on water temperature than aeration.

The specific heat of water is a thousand times the specific heat of air. If you bubble 1000 m³ of 30°C air through 2,000 m³ of water at 20°C you will not change the temperature perceptibly. In fact you could well lower water temperature if the relative humidity of the air is low. The lowering would be the result of heat loss due to evaporation of water into the air bubbles. A similar principle allows humans to cool, when air blows past us and evaporates water from our skin.

MYTH: *Aerating dugouts in winter cools the water and results in thicker ice.*

THE FACTS: No, there is no statistical difference between ice thickness on aerated and non-aerated dugouts. Thickness of snow on the dugout is the overwhelming factor determining ice thickness.

MYTH: *If you don't have open water in winter your aerator isn't working.*

THE FACTS: No, it is the heat in the deeper layers of dugout water that keeps the water ice-free where the air is injected. Real efficient aeration will not result in open water in winter. An effective diffuser will create such good circulation of dugout water that it will cool the entire dugout to a few tenths of a degree C in the fall before freeze up. When ice formation occurs it will be as thick as on a dugout without aeration.

Linear diffusers are efficient at circulating dugout water without creating turbulence in the surface water. Ice will form over quickly in the early winter. With a linear diffuser, ice formation will be complete except for a small number of holes a few inches in diameter where the air escapes from under the ice.

MYTH: *Placing a diffuser on the bottom of the dugout will stir up the bottom mud.*

THE FACTS: No, the best aeration and healthiest dugouts result when the diffuser is placed on the bottom of the deepest part of the dugout. If you use a diffuser on the bottom which creates lots of turbulence in the water you will stir up the mud and make the water murky. Open-ended tubing will definitely do this, as will a diffuser which is undersized for the compressor. Use a diffuser which matches the air flow of the compressor. This will not stir up the bottom sediments.


MYTH: *Open-ended tubing placed five or six feet from the surface is an effective method of aeration.*

THE FACTS: PFRA data show that oxygen levels in dugouts aerated with open-ended tubing are not as high as in dugouts using a diffuser. Because it creates so much turbulence, open-ended tubing is not traditionally located near bottom. The result is open-ended tubing only aerates and circulates the water down to the level of the air injection.

MYTH: *Aeration systems do not need to be operated continuously.*

THE FACTS: No, aeration systems work best and are most trouble-free when they are operated continuously. You could probably get adequate aeration by having your air compressor operate 12 hours each day but the wear and tear on the compressor more than outweigh the energy saving. In fact, for effective aeration it is best to operate the aeration system 24 hours a day year round. Turning compressors on and off can reduce the life of the compressor, motor, etc.

MYTH: *You only have to aerate in the winter when water quality deteriorates.*

THE FACTS: For the best water quality, dugouts should be aerated year round 

* For more "Myths about Dugout Aeration" contact your nearest PFRA office or visit their Internet website at: www.agr.ca/pfra/water/wqualite.htm

Treating Farm Ponds with Copper Sulfate for Algae Control

by Dr. Bill Mackay, University of Alberta, Department of Biological Sciences

Copper sulfate, under various formulations and trade names, is the most widely used chemical for controlling algae in farm ponds. It is cheap, effective and can be used on ponds stocked with fish, if the alkalinity is sufficiently high (more than 50 mg/L as CaCO_3).

Amount of copper sulfate to use depends on the type of algae to be controlled and the alkalinity of the water. Knowing your alkalinity is important because the carbonate can bind with ionic copper and reduce its effectiveness.

Single cell and colonial planktonic algae are more sensitive to copper than filamentous types. Unicellular algae include diatoms and many species of green and blue-green algae. Filamentous algae mainly include green algae (*Spirogyra*, *Chara*, *Nitella*). A simple test to see if you have filamentous or blue-green algae is to pick them up with your hand, fingers slightly apart. If the algae fall between your fingers, you have blue-green algae. If you can pick them up as a mat, you have filamentous green algae.

To control single cell (blue-green) algae - use 0.1 to 0.3 grams of copper sulfate for each cubic metre of water being treated. In a pond 30 metres (100 feet) by 60 metres (200 feet) treat the top one or two metres. If you treat the top metre add $(30 \times 60 \times 1 \times 0.2=)$ 360 grams (0.8 pounds) of copper sulfate. If treating the top 2 metres add 720 grams (1.6 pounds). In unaerated dugouts, all the algae should be in the top two metres or less, as light will likely not penetrate beyond that depth. In aerated dugouts, the water is circulated and algae will be more uniformly distributed through the dugout. In this case, consider treating the whole dugout volume. When calculating volume of the whole dugout, remember the sides and ends are sloped.

It is very important to check the water's alkalinity before treating.

Alkalinity is usually between 100 and 200 mg CaCO_3 /L in western Canada. However water from muskeg environments or old dugouts may have lower alkalinity. Dugouts with routine evaporative water loss or located near alkaline soils or runoff may have a high alkalinity > 200 mg CaCO_3 . If treating water containing fish, do only half the pond one day and the other half the next day. This is particularly important with water having low alkalinity or when using higher dosages ($> 1 \text{ g/m}^3$) of copper sulfate.

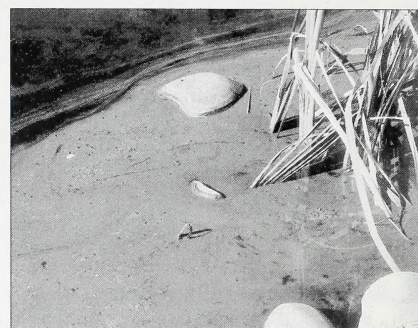
To control filamentous algae - use the rates in the following table for guidelines. Rates can vary from 0.5 g/m^3 to 2 g/m^3 in high alkalinity waters (alkalinities of 200-400 mg CaCO_3 /L).

For a typical PFRA dugout the dose of copper sulfate required to treat filamentous algae in the top metre would be $(30 \times 60 \times 1 \times 0.7)$ 1.26 kg (2.8 pounds) and for the top two metres $(30 \times 60 \times 2 \times 0.7=)$ 2.52 kg (5.6 pounds).

Alkalinity of Water mg CaCO_3 /L	Treatment Dose $\text{CuSO}_4\text{g/m}^3$	Comments
less than 50	0.5	Do not treat with fish present
50-100	0.5	Use caution with fish present
100-200	0.5 to 1.0	
200-400	1-2	
more than 400		Do not use CuSO_4 for algae control

Application of copper sulfate

For best control of algae, mix copper sulfate well with water, particularly the surface water. Treat in the early stages of development and when the water is calm, not on windy or rainy days.



Crystalline form - Copper sulfate is most often obtained in a crystalline form. This can be easily applied by placing the appropriate amount for the treatment in a bag and dragging the bag around on the surface of the pond. Apply this from a boat, or from shore using an inner-tube and a rope with the bag hanging in the centre of the inner-tube. Have the rope going to each shore, to one person on each side of the pond. The inner tube can then be pulled easily around on the surface of the pond until the copper sulfate dissolves.

Powder or liquid form - Powdered copper sulfate can easily be dissolved in water and the solution sprayed on the surface of the pond. This can also be done with the liquid form.

REMEMBER! The safety of your fish is paramount! Consider using only the lowest recommended rates or try safer copper formulations, such as Cutrine-Plus, with chelated copper. Another option is treating only 1/3 of the pond every second or third day or try spot treating small areas. Large algae die-offs can deplete oxygen 🐟

For more information contact an Agriculture Water Specialist, through your nearest AAFRD or PFRA district office.

Aquaculture Section Update ... by D. Lloyd

Alberta Aquaculture: In the New Millennium

During the last three years of the century, aquaculture in Alberta has advanced rapidly, changing from a number of small scale fish farms producing mainly rainbow trout for the fingerling market to an estimated 11 million dollar industry. Alberta's aquaculturists now raise a number of new fish species and are involved with supplying fish for various table markets, for biological weed control and for U-fish opportunities. Worldwide, aquaculture is at a turning point, as wild fisheries continue to decline. As a relatively new industry in Alberta this sector is at a pivotal junction. Alberta has a tremendous potential for aquaculture success if certain critical factors are addressed and fulfilled.

In partnership, industry and government need to create a sustainable development strategy or plan. This plan must support and enable industry to continually upgrade its capability to secure and maintain a competitive advantage. Among the key issues needing to be addressed are: market competition and policy / regulatory constraints.

Globalization has increased the pressures of competitiveness, but this will also generate new market opportunities. In Alberta, we need to take a strategic approach to marketing and plan marketing thrusts in a coordinated fashion. It is essential for the aquaculture sector to be armed with market intelligence in order to adapt quickly to change in domestic and foreign markets.

Aquaculture development must not be unduly constrained or burdened by government policy or regulatory framework.


At the same time however, development must be consistent with government responsibilities in protecting the environment. To tackle the issues, in an orderly and effective manner, we need to develop a framework and a strategy to guide us. The Aquaculture Section looks forward to working in partnership with industry to develop a living document that will carry us through the first decade of the new millennium.

New Changes to the Provincial Employment Standards Regulations Will Directly Affect Aquaculture

On July 1, 2000, the Employment Standards Regulations will be effectively amended to include aquaculture as a primary agriculture operation.

What this means is the production of cultured fish within the context of the Fisheries (Alberta) Act is now covered the same as other agriculture industries. Employees in the aquaculture industry are now exempt from :

- minimum wages;
- hours of work, overtime and overtime pay;
- general holidays and general holiday pay;
- vacations and vacation pay;
- restrictions on employing children under 18 years.

If you have any questions, please call the Employment Standards Information Line. Dial 310-0000, then dial toll free (780) 427-3731 or visit your closest Employment Standards office of Alberta's Human Resources and Employment 

Duncan Lloyd, Manager of AAFRD's Aquaculture Section, in Lethbridge, telephone (403) 381-5539



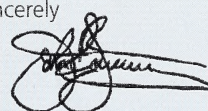
Alberta Fish Farmers Association Renewed Strength for the New Millennium

It's now six months into the new millennium and looking positive: the new executives of the Alberta Fish Farmers Association (AFFA) have been formally sworn in. They include: John Bjornson - President, Lorne Loudon - Secretary Treasurer, Terry Schroeder - Vice President, and five directors: Doug Millar, Bob Allen, Dave White, Curt McNaughton and Clay Boyes.

The AFFA received a grant through Alberta Lotteries Foundation to hire an executive assistant for one year. As well, provincial funds have become available which help us match other agencies and start partnering in research, such as with Eagle Lake rainbow trout or silver carp for algae control.

The next AFFA meeting is planned in July, at Lethbridge, during the National Recirculation Workshop. We will need your help at the workshop. We will also be running a number of "Raising Fish in Your Pond" courses again this winter. These require your input on locations. Please call Lorne Loudon - Secretary Treasurer at (780) 878-3839, if you can help with any of the above.

Sincerely

A handwritten signature in black ink, appearing to read "John Bjornson", written over a circular stamp or seal.

John Bjornson, President

COURSES, PUBLICATIONS & EVI



COURSES

National Recirculating Aquaculture Workshop is a must for those interested in intensive fish culture. Cost of the workshop is exceptionally low, at \$100. There will be presentations from renown speakers across North America. Best of all, it's to be held in Lethbridge from July 13 to 15, 2000 at the Lethbridge Community College. Reasonable accommodation is available at the College. Register early, as seating is limited. (See **EVENTS**, this page)

Broodstock Management will again be offered this fall by AAFRD in conjunction with the Lethbridge Community College and the Alberta Fish Farmers Association.

The course, planned for November, in Lethbridge, coincides with spawning activities at a local hatchery. The course is for those intending to raise their own brood fish, spawn them and obtain young. It will cover egg stripping, incubation, larval husbandry, manipulation of fish to produce sterility, and brood fish conditioning and spawning. Enrollment is limited to 12 students only.

To obtain more information on these courses contact: Eric Hutchings, of AAFRD's Aquaculture Section in Lethbridge, toll free by dialling 310-0000, then 381-5574 or dial direct with area code (403) 381-5574.

PUBLICATIONS

A selection of aquaculture publications and videos are available on a short-term loan through your local AAFRD office. Most are maintained with the Aquaculture Section in Lethbridge (the contact person is Judy Lee at (403) 381-5106).

Also, the following fact sheets are available at the AAFRD office near you, or



"Raising Fish in Your Pond" courses, like this one at Ministic Hall, were successfully held at eighteen Alberta locations this past winter. More are planned in 2001!

on our Internet website, including:

Aeration of Dugouts or Ponds with Compressed Air. Agdex 716 (B36)

Algae Control in Ponds. Agdex 485/716-2

Aquaculture Profit\$... for a rainbow trout intensive fingerling enterprise. Agdex 485/821-1

Biological Weed Control in Alberta using Triploid Grass Carp. Agdex 485/641-1

Constructing Dugouts for Fish. Agdex 485/716-1

Fish Culture Licences. Agdex 485/84-1

Freshwater Aquaculture Industry.
Ag - Venture series Agdex 485/830-1
(under review)

Predator Damage Control. Agdex 485/685-1

Screening Your Fish Pond. Agdex 485/87-1

EVENTS

July 13-15, 2000 National Recirculating Aquaculture Workshop at Lethbridge, Alberta, Canada. This workshop will address all the technologies used to raise fish successfully in a closed system. This is the first such workshop in inland western

Canada. Speakers will cover water reuse, filtration, structures and management of disease and waste. Contact Cheryl Regier at (403) 382-6991; Fax at (403) 317-3504 or Email at cdregier@raptor.lethbridge.ab.ca

July 20-23, 2000 The Third International Conference on Recirculating Aquaculture Systems - Hotel Roanoke & Conference Center Roanoke, VA

July 25-29, 2000 Ft. Pierce, Florida Recirculating Aquaculture Systems. This intensive 5-day course covers design and operation of recirculating systems for culturing molluscs, crustaceans, and finfish in fresh and saltwater. Offered by Harbor Branch Oceanographic Institution - Aquaculture Center. Details can be found on: www.aquaculture-online.org
Or contact: Tel: 1-800-333-4264 or 1-561-465-2400 ext. 416 FAX: 1-561-466-6590 email: acted@hboi.edu

September 3 - 5, 2000. The Fifth International Symposium on Tilapia in Aquaculture will be held in Rio de Janeiro, Brazil. The ISTA Symposia are principal meetings for tilapia producers, marketers & researchers. For more information visit: <http://Ag.Arizona.Edu/azaqua/ista/ista5.htm>

January 21-25, 2001 AQUACULTURE '01 Disney's Coronado Springs Resort, Orlando, Florida USA. World Aquaculture '01 held in conjunction with the Triennial Meeting of WAS, the National Shell Fisheries Association and Fish Culture Section of American Fisheries Society. Co-sponsored by National Aquaculture Association, US Aquaculture Suppliers Association, US Chapter of WAS

Editor's Notes

This is the first issue of Aquaculture in Alberta produced in year 2000. A second issue is planned in the fall season. If you would like to submit articles, provide us with input or be placed on the mailing list, contact Eric Hutchings, the editor, in Lethbridge at (403) 381-5574 or use the following E-mail address eric.hutchings@gov.ab.ca

The Internet address for Alberta Agriculture, Food and Rural

Development's "**Ropin' the Web**" Home Page is www.agric.gov.ab.ca This home page contains aquaculture information (fact sheets, fingerling suppliers lists, aquaculture links, etc.).

Any information contained in this bulletin regarding commercial products may not be used for advertising or promotional purposes without permission from Alberta Agriculture, Food & Rural Development and is not to be construed as endorsement of any product or firm by Alberta Agriculture, Food & Rural Development